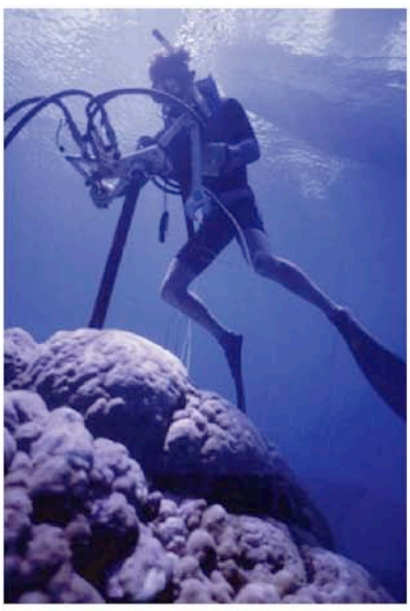
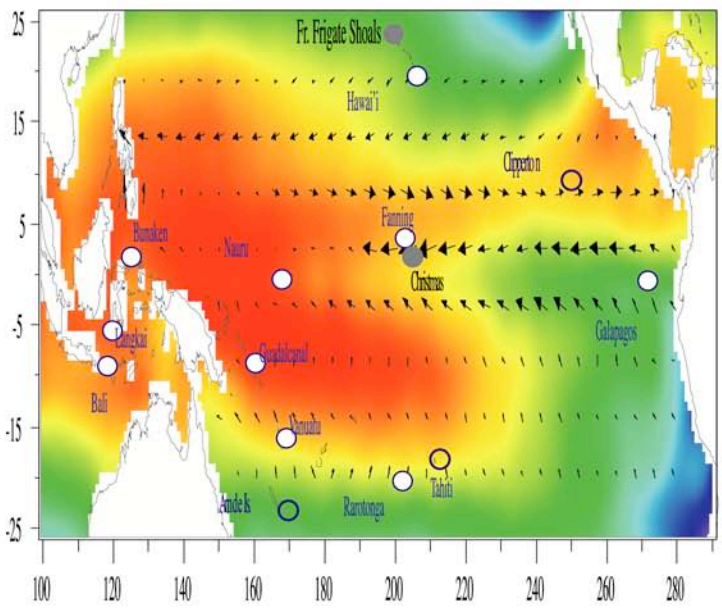
"Legacy" Time Series of Ocean $\Delta^{14}C$

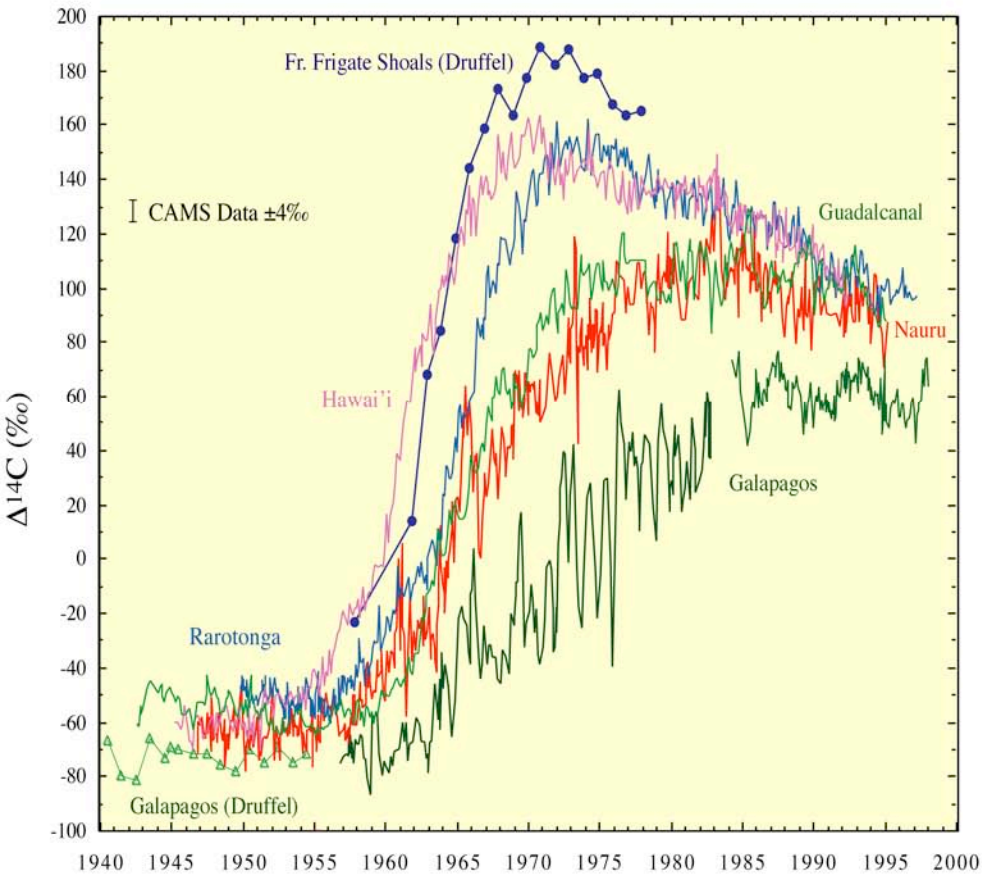
Methodology
- Use natural and bomb-^{14}C to trace water masses and study dynamics
  - Lateral advection and vertical mixing processes
- Sites (archives) from key oceanographic locatinos
- High quality results, not just quanitity
- Augments "one-time" surveys such as GEOSECS & WOCE

What do we learn?
- Ocean circulation - i.e. climate dynamics/variability
  - dye type or transient tracer - snapshots miss the variability
- Uptake of anthropogenic CO_2
  - pre to post-bomb amplitude and timing of peak ^{14}C
  - bomb-^{14}C inventories

Reconstructing the Shallow Circulation of the Tropical Pacific







The distribution of $\Delta^{14}C$ is sensitive to vertical exchange proceses and subsequent lateral advection and is used as a quasi-conservative water mass tracer. The $\Delta^{14}C$ content of sea water is recorded in coral skeletal material, and thus coral based measurements can be used to reconstruct $\Delta^{14}C$ variability many decades into the past. The variations in $\Delta^{14}C$ can be used to study dynamic processes, air-sea CO_2 exchange, and ultimately to "un-mix" water masses.

Superimposed over the long term incrase in $\Delta^{14}C$ reflecting oceanic uptake of bomb derived ^{14}C are higher amplitude variatins. At Nauru and Guadalcanal these large excursions reflect the redistribution of surface waters in the tropical Pacific whereas at the Galapagos the excursions reflect variations in thermocline dynamics.